

**CLAIMS:**

What is claimed is:

- 1 1. An optical power management apparatus, comprising:  
2 a plurality of optical power sources;  
3 a plurality of optical data devices;  
4 an optical power redirection unit, said optical  
5 power redirection unit selectively coupling at least one  
6 output of said plurality of optical power sources to at  
7 least one input of said plurality of optical data devices  
8 in accordance with a predefined or an algorithmically  
9 controlled optical coupling ratio.
- 1 2. The optical power management apparatus of Claim 1,  
2 further comprising:  
3 a monitor unit, said monitor unit coupled to said  
4 plurality of optical data devices and said optical power  
5 redirection unit; and  
6 a controller unit for controlling the management of  
7 said plurality of optical data devices, said controller  
8 unit coupled to said plurality of optical data devices  
9 and said monitor, said monitor unit operable to:  
10 determine a plurality of coupling ratios for  
11 coupling power from said plurality of optical power  
12 sources to said plurality of optical data devices; and  
13 convey said plurality of coupling ratios to said  
14 optical power redirection unit.

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1 3. The optical power management apparatus of Claim 1,  
2 wherein said plurality of optical power sources comprises  
3 a plurality of laser power sources.

1 4. The optical power management apparatus of Claim 1,  
2 wherein said plurality of optical data devices comprises  
3 a plurality of optical data management and/or storage  
4 devices.

1 5. The optical power management apparatus of Claim 1,  
2 wherein said optical power redirection unit comprises:  
3 an optical power switch unit; and  
4 a tunable optical power coupler unit.

1 6. The optical power management apparatus of Claim 1,  
2 wherein said optical power redirection unit comprises:  
3 an optical power combiner unit; and  
4 a tunable optical power coupler unit.

1 7. The optical power management apparatus of Claim 2,  
2 wherein said monitor unit comprises a laser power monitor  
3 unit, and said controller unit comprises an optical data  
4 device system controller.

1 8. The optical power management apparatus of Claim 1,  
2 further comprising:  
3 means for dividing the optical power received by  
4 each optical data device into a plurality of optical  
5 powers;

6 means for matching the optical path length of a  
7 plurality of optical power conductors, said plurality of  
8 matched optical power conductors coupling said plurality  
9 of optical powers from said means for dividing to a  
10 respective optical data device of said plurality of  
11 optical data devices.

1 9. The optical power management apparatus of Claim 1,  
2 wherein said optical power redirection unit selectively  
3 couples said at least one output of said plurality of  
4 optical power sources on demand, said demand associated  
5 with a higher priority of at least one optical data  
6 device of said plurality of optical data devices, and for  
7 improving performance of said plurality of optical data  
8 devices with said higher priority.

1 10. The optical power management apparatus of Claim 1,  
2 wherein said optical power redirection unit selectively  
3 couples said at least one output of said plurality of  
4 optical power sources on demand, for more efficient use  
5 of available optical power.

1 11. A method for distributing optical<sup>✓</sup> power to a  
2 plurality of optical data devices, the method comprising  
3 the steps of:  
4 retrieving a priority signal, said priority signal  
5 associated with a priority ranking for said plurality of  
6 optical data devices;

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7       determining if said priority signal indicates a  
8   change in said priority ranking for said plurality of  
9   optical data devices; and  
10       if so, redistributing said optical power to said  
11   plurality of optical data devices.

1   12.   The method of Claim 11, further comprising the steps  
2   of:  
3       retrieving a plurality of optical power monitor  
4   signals, said plurality of optical power monitor signals  
5   associated with a plurality of power levels of a  
6   plurality of optical power sources;  
7       determining if said plurality of optical power  
8   output monitor signals indicates a defect in at least one  
9   optical power source of said plurality of optical power  
10   sources; and  
11       if so, redistributing said optical power to said  
12   plurality of optical data devices.

1   13.   The method of Claim 12, further comprising the step  
2   of sending a flag to a management unit, said flag  
3   indicating at least one of said defect and a request to  
4   correct said defect.

1   14.   The method of Claim 12, further comprising the step  
2   of redistributing said optical power to said plurality of  
3   optical data devices without incurring system down time.

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1 15. The method of Claim 13, further comprising the step  
2 of field replacement of said at least one defective  
3 optical power source without system down time.

1 16. The method of Claim 11, further comprising the steps  
2 of:  
3 retrieving a plurality of optical power monitor  
4 signals, said plurality of optical power monitor signals  
5 associated with a plurality of optical power levels  
6 received at a plurality of optical data devices;  
7 determining if said plurality of optical power  
8 output monitor signals indicates a defect associated with  
9 an optical power distribution to at least one optical  
10 data device of said plurality of optical data devices;  
11 and  
12 if so, redistributing said optical power to said  
13 plurality of optical data devices.

1 17. The method of Claim 16, further comprising the step  
2 of sending a flag to a management unit, said flag  
3 indicating said defect, and a request to correct said  
4 defect.

1 18. The method of Claim 17, further comprising the step  
2 of field replacement of said defect associated with said  
3 optical power distribution without system down time.

1 19. The method of Claim 11, further comprising the steps  
2 of:

3        retrieving a plurality of power monitor signals from  
4        said plurality of optical data devices;  
5        determining if said plurality of power monitor  
6        signals from said plurality of optical data devices  
7        indicates a difference in a first power coupling ratio  
8        associated with a distribution of said optical power to  
9        said plurality of optical data devices; and  
10       if so, calculating a second power coupling ratio  
11       associated with said distribution of said optical power  
12       to said plurality of optical data devices.

1       20. The method of Claim 11, wherein said optical power  
2       comprises laser power.

1       21. The method of Claim 20, wherein said laser power  
2       comprises power derived from a CW laser or a pulsed  
3       laser.

1       22. The method of Claim 11, wherein a plurality of data  
2       devices comprises a plurality of optical data management  
3       or storage devices.

1       23. The method of Claim 11, wherein the redistributing  
2       step is performed by an optical power switch and tunable  
3       coupler.

1       24. The method of Claim 11, wherein the redistributing  
2       step is performed by an optical power combiner unit and  
3       a tunable optical power coupler unit.

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1 25. The method of Claim 19, wherein said first power  
2 coupling ratio comprises a plurality of power coupling  
3 ratios.

1 26. A method for monitoring the usage of a plurality of  
2 optical power sources, the method comprising the steps of  
3 keeping track of the time and duration of usage of  
4 each optical power source; and  
5 keeping track of the total energy delivered by each  
6 optical power source.

1 27. The method of Claim 26, further comprising the step  
2 of:  
3 performing preventive maintenance by requesting the  
4 preventive servicing or replacement of optical power  
5 sources that have surpassed a certain time period or  
6 energy level of usage.

1 28. The method of Claim 26, further comprising the steps  
2 of:  
3 increasing the useful life of each optical power  
4 source by employing at least one of the following  
5 methods:  
6 (a) guaranteeing minimum use of every source over a  
7 period of time; and  
8 (b) equalizing the amount of energy delivered by  
9 all the sources, possibly constrained by the  
10 performance priorities of the optical data  
11 devices.

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1 29. The method of Claim 26, wherein said optical power  
2 comprises laser power.

1 30. The method of Claim 11, wherein said laser power  
2 comprises power derived from a CW laser or a pulsed  
3 laser.

1 31. A computer program product in a computer readable  
2 medium for use in an optical power distribution  
3 management apparatus, the computer program product  
4 comprising:  
5 first instructions for retrieving a priority signal,  
6 said priority signal associated with a priority ranking  
7 for a plurality of optical data devices;  
8 second instructions for determining if said priority  
9 signal indicates a change in said priority ranking for  
10 said plurality of optical data devices; and  
11 third instructions for redistributing said optical  
12 power to said plurality of optical data devices if said  
13 priority signal indicates said change.

1 32. The computer program product of Claim 31, wherein  
2 said second instructions further comprise:  
3 renormalizing a plurality of coupling ratios if said  
4 priority signal indicates said change in said priority  
5 ranking for said plurality of optical data devices.

1 33. The computer program product of Claim 31, further  
2 comprising:



3        fourth instructions for retrieving a plurality of  
4        optical power monitor signals, said plurality of optical  
5        power monitor signals associated with a plurality of  
6        power levels of a plurality of optical power sources;  
7        fifth instructions for determining if said plurality  
8        of optical power output monitor signals indicates a  
9        defect in at least one power level of said plurality of  
10       power levels; and  
11       sixth instructions for redistributing said optical  
12       power to said plurality of optical data devices if said  
13       plurality of optical power output monitor signals  
14       indicates said defect.

1    34.   The computer program product of Claim 33, wherein  
2    said fifth instructions further comprise sending a flag  
3    to a management unit, said flag indicating at least one  
4    of said defect and a request to correct said defect.

1    35.   The computer program product of Claim 31, further  
2    comprising:

3        seventh instructions for retrieving a plurality of  
4        power monitor signals from said plurality of optical data  
5        devices;  
6        eighth instructions for determining if said  
7        plurality of power monitor signals from said plurality of  
8        optical data devices indicates a difference in a power  
9        coupling ratio associated with a distribution of said  
10       optical power to said plurality of optical data devices;  
11       and

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12           ninth instructions for calculating a second power  
13 coupling ratio associated with said distribution of said  
14 optical power to said plurality of optical data devices  
15 if said plurality of power monitor signals from said  
16 plurality of optical data devices indicates said  
17 difference.

1   36. The computer program product of Claim 31, further  
2 comprising:  
3           tenth instructions for determining whether an  
4 optical connection to a plurality of optical data devices  
5 is defective; and  
6           eleventh instructions for sending a flag to a  
7 management unit, said flag indicating said defect, and a  
8 request to correct said defect.

1   37. The computer program product of Claim 31, wherein  
2 said optical power comprises laser power.

1   38. The computer program product of Claim 31, wherein  
2 said plurality of optical data devices comprises a  
3 plurality of optical data management or storage devices.

1   39. The computer program product of Claim 31, wherein  
2 said third instructions are performed by an optical power  
3 switch and tunable coupler.

1   40. The computer program product of Claim 35, wherein  
2 said power coupling ratio comprises a plurality of power  
3 coupling ratios.

41. An optical power distribution apparatus, comprising:  
a plurality of equipment units, each equipment unit  
of said plurality of equipment units coupled to at least  
one other equipment unit of said plurality of equipment  
units for conveying optical power therebetween, and  
wherein at least one equipment unit of said plurality of  
equipment units further comprises:  
a plurality of optical power source modules;  
a plurality of optical data device modules;  
an optical power redirection module, said optical  
power redirection module coupling a plurality of outputs  
of said plurality of optical power source modules to a  
plurality of inputs of said plurality of optical data  
device modules; and  
a power monitor module, said power monitor module  
coupled to said plurality of optical data device modules  
and said optical power redirection module.

42. The optical power distribution apparatus of Claim  
41, wherein said plurality of optical power source  
modules, said plurality of optical data device modules,  
said optical power redirection module, and said power  
monitor module are each structured in accordance with a  
similar form factor.

43. The optical power distribution apparatus of Claim  
42, wherein said form factor is associated with ease of  
field replacement for an optical power source module of  
said plurality of optical power source modules, an  
optical data device module of said plurality of optical

6 data device modules, said optical power redirection  
7 module, and said power monitor module.

1 44. The optical power distribution apparatus of Claim  
2 42, wherein said form factor is associated with ease of  
3 upgrade for an optical power source module of said  
4 plurality of optical power source modules, an optical  
5 data device module of said plurality of optical data  
6 device modules, said optical power redirection module,  
7 and said power monitor module.

1 45. The optical power distribution apparatus of Claim  
2 42, wherein said form factor is associated with ease of  
3 adding an optical power source module of said plurality  
4 of optical power source modules, an optical data device  
5 module of said plurality of optical data device modules,  
6 an additional optical power redirection module, or an  
7 additional power monitor module to said at least one  
8 equipment unit of said plurality of equipment units.

1 46. The optical power distribution apparatus of Claim  
2 41, wherein at least one module of said plurality of  
3 optical power source modules and said plurality of  
4 optical data device modules is arranged on a second  
5 equipment unit of said plurality of equipment units.

1 47. The optical power distribution apparatus of Claim  
2 41, wherein a plurality of optical power coupling  
3 conductors for conveying optical power between modules, a  
4 plurality of electronic signal coupling conductors for

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5 conveying electronic signals, and a plurality of  
6 electrical power coupling conductors for conveying  
7 electrical power to said modules, are arranged as a  
8 single bundle of conductors, said single bundle of  
9 conductors associated with ease of routing of optical and  
10 electrical power and of electronic signals.

1 48. The optical power distribution apparatus of Claim  
2 42, wherein said similar form factor and a same  
3 functional operation for each of said modules is  
4 associated with module redundancy and increased fault-  
5 tolerance for the optical power distribution apparatus.

1 49. The optical power distribution apparatus of Claim  
2 41, wherein said power monitor module further comprises  
3 means for monitoring optical power at an input of an  
4 optical data device of each optical data device module of  
5 said plurality of optical data device modules.

1 50. The optical power distribution apparatus of Claim  
2 41, wherein said power monitor module further comprises  
3 means for fault detection, said means for fault detection  
4 including at least one of:  
5 means for monitoring optical power at an input of an  
6 optical data device of each optical data device module of  
7 said plurality of optical data device modules; and  
8 means for monitoring optical power at an output of  
9 an optical power source of each optical power source  
10 module of said plurality of optical power source modules.

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1 51. The optical power distribution apparatus of Claim  
2 41, wherein said optical power comprises laser power.

1 52. The optical power distribution apparatus of Claim  
2 51, wherein said laser power comprises power derived from  
3 a CW laser or a pulsed laser.